

STUDIES IN AUSTRALIAN *NEUROPTERA*.

No. i. THE WING-VENATION OF THE MYRMELEONIDÆ.

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(Plate lviii., and ten Text-figs.)

INTRODUCTION.

In entering upon the study of Australian Neuroptera, my intention is eventually to attempt to work out the little-known life-histories of these insects, and to contribute something towards the study of the morphology of their larvæ and pupæ. However, we know as yet so little about the Australian forms, that it is clearly of the first importance that their systematic classification should be placed upon a secure foundation, before any other work can be satisfactorily proceeded with. With the aid of collections sent by Mr. W. W. Froggatt, F.L.S., Government Entomologist of New South Wales, and by myself, Mr. Esben Petersen, of Silkeborg, Denmark, has lately been enabled to unravel a great deal of the tangle surrounding the isolated and often incomplete descriptions of Australian forms published during the past hundred years or more. Two of his papers* have been published quite recently in these Proceedings. Mr. Petersen had previously undertaken a tour of the principal Museums of Europe, and had carried with him a number of specimens from Australia, for comparison with the old types. He also secured photographs of nearly all of these latter. Thus he has been able to give us, not only a number of excellent descriptions of new species, but also some valuable observations on the synonymy of many of the better known forms. It may be truthfully said, that Mr.

* Esben Petersen, Australian Neuroptera, Part i., These Proceedings, 1914, xxxix., pp. 635-645, Plates lxxii.-lxxv.; Part ii., *l.c.*, 1915, xl., pp. 56-74, Plates vi.-xiii.

Petersen's two papers form a basis, without which it would have been inadvisable for any Australian entomologist to undertake the study of this Order; and that Australian scientists, as a whole, must be deeply indebted to him for his excellent and painstaking work.

Before Mr. Petersen's papers were published, I had already studied a considerable number of rare Neuropterous insects in my own Collection. Many of these were sent to him for his opinion, and I now desire to thank him for his valuable advice and help in this direction. In many cases, it was quite impossible to determine a species as definitely new, until it had been compared with some old type, owing to the often glaring inadequacy of some of the older published descriptions. In order to do justice to the excellent work of McLachlan and others, it is only fair to state that the principal obstacle in this respect has always been Walker,* whose work is here strongly recommended to any Australian entomologist as a model of how descriptions of insects should *not* be written. Fortunately, Mr. Petersen has seen Walker's types, and we may now hope that the fog caused by that painstaking "manufacturer" of new species has been permanently lifted.

The species described as new from my own Collection, together with a number sent to me for study from other parts of Australia, will be published in No.2 of this series of papers. Meanwhile, as the whole scheme of classification hinges chiefly on the wing-venation, it was found necessary to deal with this matter first of all. In No.1 of this series, therefore, I offer the results of my study of the pupal wing-tracheation of the *Myrmeleonidae*, together with some remarks on certain special structures in the imaginal venation which are of value to the systematist.

The species selected for study was *Myrmeleon uniseriatus* Gerst. Its larva is perhaps the commonest and most easily noticed of the Ant-lions of the Sydney district. This species

* Catalogue of Neuropterous Insects in the Collections of the British Museum, 1853.

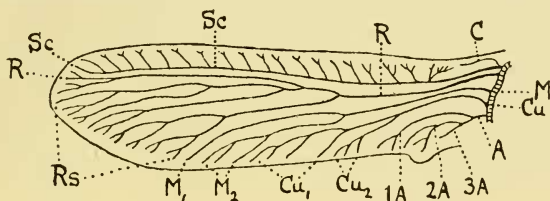
makes a number of pits in my garden every year, and has thus provided both easily accessible and sufficiently abundant material for all purposes.

About a dozen larvæ were collected in October, 1914. These were placed on a smooth layer of sand in a large flat tin about three inches deep. They at once burrowed, and very soon had completed their characteristic conical pits. Each pit was regularly supplied with an ant once or twice a day, and a careful watch kept for any instance of refusal to eat on the part of the larva. For some weeks, the ant-lions fed regularly on all that was offered them. Then, one day, it was seen that one of the larvæ had refused an ant. At next feeding-time, the sand was carefully put through a sieve, and, as expected, a freshly-formed spherical cocoon of sand-grains was recovered. The other larvæ re-formed their pits and went on feeding. A few days later, another fresh cocoon was obtained, and, soon afterwards, the majority of the larvæ had spun their neat little homes in the sand.

These cocoons were all placed on sand in a tray covered with a cage of mosquito-netting. The first cocoon was cut open six days after its recovery from the sand. It was found that the enclosed larva had not yet pupated. The next was opened after seven days, with the same result. A third, eight days old, contained an evidently freshly formed pupa. Finally, the pupa selected for dissection was one taken from a cocoon thirteen days old, in which the wing-sheaths appeared to be eminently suitable for the object in view. This pupa was very active, and was killed with chloroform. The wing-sheaths were then quickly dissected off under water, and floated on to a slide. A light cover-slip was then let down gently upon them, and they were transferred at once to Reichert's photomicrographic apparatus, where three satisfactory photographs were obtained. These are reproduced in Plate lviii., and are made the basis of a comparative study with the imaginal venation.

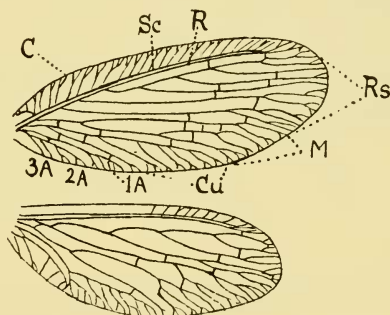
It will be seen that the obtaining of suitable material in the right condition is not an easy matter. Comstock and Needham,

in their famous work on the Wing-Venation of Insects,* did not deal with the *Myrmeleonidae*, but they succeeded in photographing the tracheation of the pupal wing of one of the *Hemerobiidae*.



Text-fig. 1.—Wing-tracheation from the forewing-sheath of a pupa of an Hemerobiid, much enlarged. Adapted from Comstock and Needham.

They happened to hit upon a form, therefore, in which the venation is remarkably easy to determine, since it agrees in almost every detail with the pupal tracheation preceding it. This can be seen from figs. 1-2. All the main veins of the imaginal wing follow the curves of their corresponding tracheæ, except for a certain amount of secondary fusion at their bases; (the tracheæ are, of course, quite separate at their bases, owing to the greater breadth of the wing-sheath). It is thus possible, in the case of *Hemerobius*, to indicate, without any shadow of doubt, the number and limits of the radial sectors (Rs), the position of the two-branched media (M), of the two-branched cubitus (Cu), and of the three-branched analis (1A, 2A, 3A). Such a complete agreement between tracheation and venation indicates, of course, a great lack of specialisation in the latter, and suggests

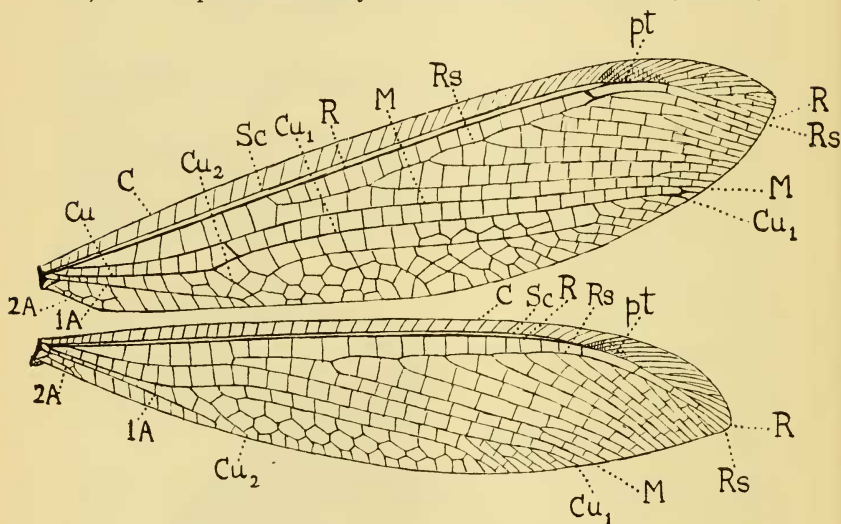


Text-fig. 2.
Wings of *Hemerobius nitidulus* (× 8).
Adapted from Handlirsch.

* "The Wings of Insects," American Naturalist, 1898, xxxii, seven parts.

that the *Hemerobiidae* have preserved, with very little alteration, an original archaic wing-plan.

An examination of the wing-venation of a Myrmeleonid (Text-fig.3) suggests that there could be nothing rash in at once naming off all the principal veins and branches without reference to the pupal tracheation. Three obvious differences from the Hemerobiid plan are at once recognisable, viz., the presence of only a single radial sector, Rs, the unbranched condition of the media, M, and the presence of only two branches of the analis (1A, 2A).

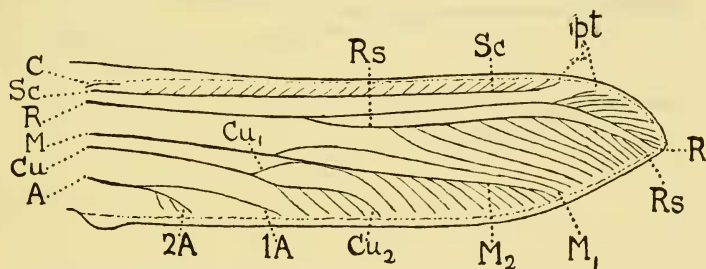


Text-fig.3.—Wings of *Myrmeleon uniseriatus* ($\times 3$), to show the usually accepted venational nomenclature. (Original).

All students of the *Myrmeleonidae* have applied the Comstock-Needham notation to this venation in the manner shown in Text-fig.3, and it seemed that there was no more to be said on the subject.

Now the *Myrmeleonidae* are admittedly, by their specialised life-history, and by the success of their evolutionary effort, in comparison with that of the other groups of Neuroptera, the most advanced family in the group (except perhaps the *Chrysopidae*). It seemed to me very strange, therefore, that we should all accept

tacitly the suggestion that they had such an unspecialised system of wing-venation, without any confirmation from the pupal tracheation. The suspicion that all was not right led me to study the venation in several well-known genera more carefully. But I obtained no light on this subject for a long time, until one day I noted the *persistent obliquity* of a certain cross-vein just above, and distad from the cubital fork in the forewing of the genus *Acanthaclisis*. Recalling the importance of a similar occurrence in the wings of Odonata, I at once sought for this oblique cross-vein in other genera, and was rewarded by finding it clearly present in the forewings of almost every specimen of *Myrmeleonidae* in my collection. I could not, however, detect any sign of it in the hindwing in any case. As the venations of the two wings appear otherwise to be exceedingly similar, I determined to study the pupal tracheation, and it was with this end in view that the pupæ of *Myrmeleon uniseriatus* were obtained.

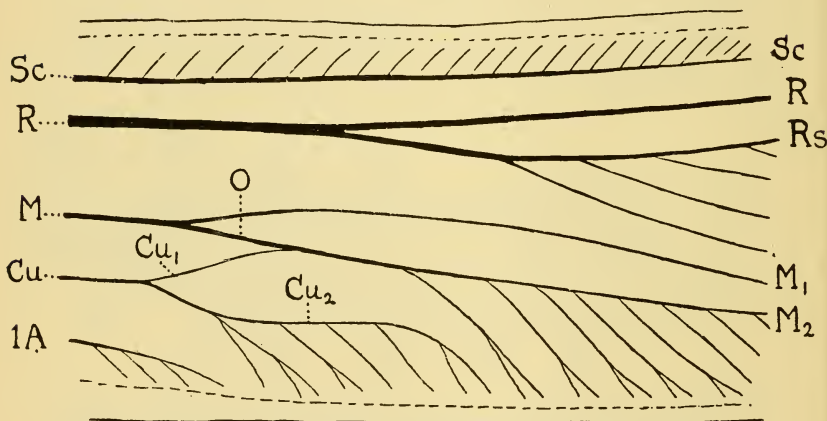


Text-fig. 4.—Wing-tracheation from the right forewing-sheath of a pupa of *M. uniseriatus* ($\times 19$), to show correct naming of tracheæ. Compare Plate lviii., fig. 1. (Original).

As soon as the photomicrographs of the pupal wing-sheath were studied, the reason for the persistent obliquity of the cross-vein above-mentioned was made clear. Text-fig. 4 shows the pupal tracheation of the forewing, while Text-fig. 5 shows the most important portion of it enlarged. In Text-fig. 6, I have reproduced the imaginal venation of the forewing for comparison, together with the alterations in notation that will now be necessary. The results may be stated as follows.

(1). The course and limits of the subcosta (Sc), radius (R), radial sector (Rs), and analis (1A, 2A) are the same as in the generally accepted scheme (Text-fig.3), and need no further consideration.

(2). The supposedly simple median vein is really *two-branched*, as in most *Hemerobiidae*, *Osmyliidae*, and *Nymphidae*. In the tracheation, the thicker and straighter of the two branches is the lower one, M_2 , from which the weaker M_1 arches weakly upwards, to run above and nearly parallel to M_2 . The upper branch of the cubitus (Cu_1), which forks at a level slightly proximal to that at which M forks, is also weak, and arches similarly upwards, to meet M_2 just distally from the fork, and there unite with it.

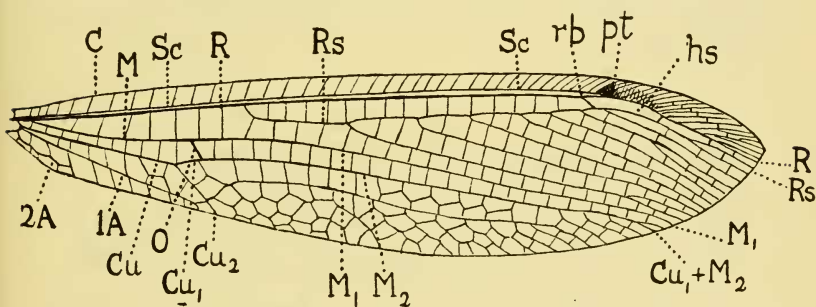


Text-fig.5.—Portion of Text-fig.4 enlarged ($\times 50$), to show the formation of the oblique vein O, and the cubito-median, $Cu_1 + M_2$. Compare Plate lviii., fig.2. (Original).

Now, in the imaginal venation, a peculiar transformation occurs. The strong, straight, lower branch of the media, M_2 , becomes sharply bent downwards at the fork, thus forming the oblique vein O, whose persistence had so puzzled me before. This lower branch M_2 consequently unites with the much weaker Cu_1 at the lower end of O. At that point it bends away distad again, *exactly continuing the line of Cu_1 itself*. No wonder, then,

that the resulting vein has been labelled Cu_1 without any hesitation, for the deception is almost as complete as Nature could possibly have made it, and the oblique vein is the only clue left to the discovery of this remarkable venational freak.

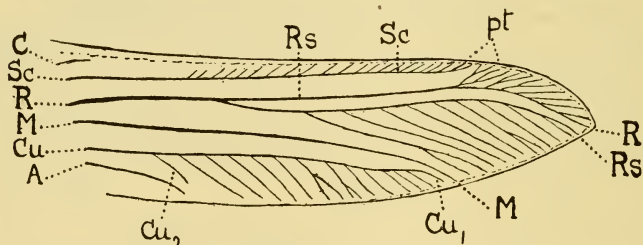
We see, therefore, that in the *forewing* of *Myrmeleonidae*, the media is really two-branched, and that the vein usually called the "upper branch of the cubitus" and labelled Cu_1 , is really a composite vein, formed proximally—for the short distance from the cubital fork to the foot of the oblique vein—by Cu_1 , and thence distad by M_2 . I propose, therefore, to name it the *cubito-median vein*, with the notation $Cu_1 + M_2$. As far as I know, there is no exact homologue to this vein in any other group of insects.



Text-fig. 6.—Forewing of *M. uniseriatus* ($\times 3$), to show the correct naming of veins. (Original).

(3). Some alteration of our ideas as to the extent of the cubitus is necessary. In the tracheation, the main stem of Cu is continued on, with only a slight downward bend, by Cu_2 as a fairly stout trachea giving off four or five descending branches. By contrast, Cu_1 is a very weak trachea running obliquely upwards to fuse with the much stouter M_2 . It is possible that the first of the branches descending from M_2 may be the cut-off end of Cu_1 . But, as this cannot be definitely shown to be the case in our photographs (though perhaps it might be seen in figures from a larger species), we must, for the present, limit Cu_1 to the short piece between the cubital fork and the foot of the oblique vein.

We must also remark that the excessively short lower branch of Cu in the venation, usually labelled Cu_2 , does not really represent the full limits of that vein, but is formed basally from the stem of Cu_2 , and distally from the first branch descending from it. The rest of Cu_2 is represented by the irregular series of crossveins up to five or six cells' width distad from Cu_2 . In *Protoplectron*, we can see a more normal arrangement, Cu_2 running along under, and parallel to Cu_1 for a considerable distance. In this respect, therefore, we must count *Protoplectron* and allies as amongst the most archaic of *Myrmeleonide*. In *Myrmeleon uniseriatus*, the supplementary vein running under and parallel to $Cu_1 + M_2$ is a purely venational development, quite unrepresented in the tracheation. It is clearly formed by alignment of the first series of crossveins below $Cu_1 + M_2$, and may be called the *cubito-median supplement*.



Text-fig. 7.—Wing-tracheation from the right hind wing-sheath of a pupa of *M. uniseriatus* ($\times 19$), to show correct naming of tracheæ. Compare the hindwing in Text-fig. 3, and Pl. lviii., fig. 3. (Original).

The venation of the hindwing in *Myrmeleonide* presents no difficulties at all, as may be seen by comparing Text-figs. 3 and 7. Both M and Cu are unbranched, and run straight through the wing. The waviness of M in the venation, and the very weak fork of Cu, are slight venational specialisations which appear to indicate a weak attempt at convergence towards the form of the forewing venation, by a different route. The weak Cu_2 which, in the hindwing, joins 1A distally, is indicated in the tracheation only as a weak branch of Cu of a calibre barely equal to

that of the numerous branches following it distally along Cu. Thus, in the hindwing, Cu₁ is the *analogue* in form and position of Cu₁ + M₂ in the forewing.

We may summarise our results as follows:—

TABLE OF MYRMELEONID VENATION.

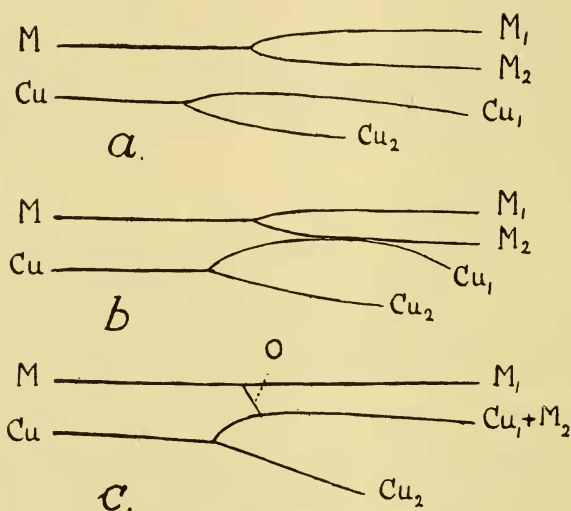
Vein.		Usual Notation.	Correct Notation.	
—		—	Forewing.	Hindwing.
Costa	C	C	C
Subcosta	Sc	Sc	Sc
Radius	{ Main Stem ...	R	R	R
	{ Radial Sector ..	Rs	Rs	Rs
Media	{ Upper Branch...	M	M ₁	absent
	{ Lower Branch... Cu ₁ (distal part)		M ₂	M
Cubitus	{ Upper Branch . Cu ₁ (proximal part)		Cu ₁	Cu ₁
	{ Lower Branch... Cu ₂		Cu ₂	Cu ₂ (weak)
Analis	{ First anal (Post-cubitus)...	1A	1A	1A
	{ Second anal (Axillary)...	2A	2A	2A
	{ Third anal (Basilar) ..	(3A)	absent or vestigial	absent or vestigial

PHYLOGENETIC CONCLUSIONS.

The phylogenetic results deducible from this new discovery are of considerable interest and importance. So far, it has not been possible to indicate with any certainty the origin of the dominant group, *Myrmeleonidae*. There has been a general agreement in looking upon the *Nymphidae*, a small family confined to Australia, as representing the probable type from which the *Myrmeleonidae* have been developed. But this agreement is not, so far as I can ascertain, based on any definite evidence, but merely on a general impression of the Myrmeleonid-like appearance of the well-known *Nymphes myrmeleonides* Leach. We now have definite venational evidence to go upon, and we may say at once that it fully establishes the claim of the *Nymphidae* to be regarded as the remains of the ancestral group from which the *Myrmeleonidae* have sprung.

In the *Nymphidae* (except in the case of the aberrant reduced genus *Austronymphes*) the median vein is forked in the forewing,

but simple in the hindwing. Also, the cubitus is strongly forked in the forewing, at a level somewhat proximal to the forking of M , while in the hindwing it is only very weakly formed. Further, it is remarkable that, in the *Nymphidae*, Cu_1 in the forewing is not strong enough to reach the distal border of the wing. It is, in fact, *dynamically* useless already, and its fusion with M_2 may be regarded as the obvious result of further weakening. If, in the venation of the forewing of *Nymphes myrmeleonides* (Text-fig. 8, a), we bring Cu_1 into apposition with M_2 (fig. 8b), we get a



Text-fig. 8.—Phylogeny of the cubito-median vein in the forewing of *Myrmeleonidae*. a, Nymphid (archaic) stage; b, Intermediate stage (apposition of Cu_1 to M_2); c, Myrmeleonid stage, with oblique vein O, and cubito-median vein completed ($Cu_1 + M_2$).

condition almost exactly represented in the pupal tracheation of *Myrmeleon*. By the fixation of the oblique vein O and the alignment of Cu_1 with the rest of M_2 , we finally get the imaginal venation of *Myrmeleon* (fig. 8, c).

Another point in which the *Nymphidae* differ from the *Myrmeleonidae* is that, in the former, R_s arises from R quite close to the

base of the wing, whereas, in the latter, it is always more or less removed from the base. The change has clearly been brought about by a gradual shifting of the point of origin of Rs distad along R. Evidence of this is furnished by *Glenoleon* and allies, in which Rs still arises, in the hindwing, so close to the wing-base that only one crossvein is interposed in the radial space before the origin of Rs. N. Banks has, indeed, divided the *Myrmeleonidae* into two subfamilies on this very character; the *Myrmeleoninae* having several crossveins before Rs in the radial space in the hindwing, the *Dendroleoninae* only one (rarely two). On phylogenetic grounds, this subdivision is now seen to be clearly justified. Moreover, as might be expected from their zoogeographical distribution, we can say definitely that the *Dendroleoninae* is the more archaic subfamily of the two.

We may conclude, then, that the *Myrmeleonidae* are a specialised and highly successful offshoot from Nymphid-like ancestors, the course of evolution being marked by the following changes:

(1). In the venation, attachment of Cu_1 in the forewing, to M_2 , to form a single strong vein, the *cubito-median*; progressive movement distad of the origin of Rs; gradual reduction in length and distinctness of Cu_2 ; also gradual reduction in the general density of venation and in the size and prominence of the pterostigma.

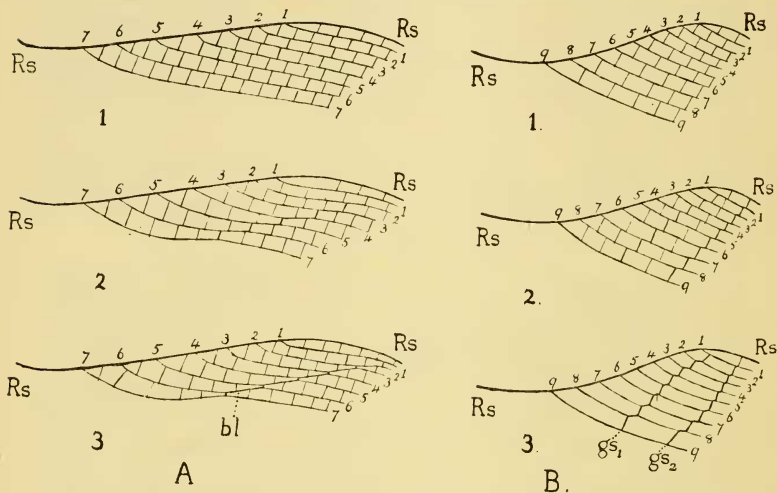
(2). In the antennæ, a gradual reduction from a moderately thickened and fairly long filiform antenna of numerous joints, as in *Nymphidae* (itself probably a specialisation from the longer and slender Osmylid-form), to a shorter and stouter form with a gradual tendency to the formation of a club at the tip.

(3). In the larval life-history, a change from a wandering (probably nocturnal), carnivorous larva, with an oval abdomen and omnivorous tastes, to a sedentary, pit-dwelling, ant-feeding form with a more rounded and specialised abdomen.

True *Myrmeleonidae* being unknown from even the latest of the Mesozoic strata, we shall probably be right in regarding this family as being of early Tertiary origin.

SOME ADDITIONAL NOTES ON THE VENATION OF MYRMELEONIDÆ.

We shall conclude this paper with a few remarks on certain structures of systematic importance in the venation, which have not come definitely within the range of study covered by the pupal tracheation.

(a) *The Banksian Line.* (Text-fig.9).

Text-fig.9.—Phylogenies of the Banksian Line (Series A) and the Gradate Series (Series B) compared. In A, the radial sector is shown with seven branches, numbered from above downwards, or from the apex inwards; Stage 1, archaic unspecialised arrangement (*Nymphes*, *Myrmeleon*, etc.); Stage 2, intermediate stage; Stage 3, Banksian line (bl) completed; note that the proximal half of branch 6 is now practically continued by the distal half of branch 7, and so on. In B, the radial sector is shown with nine branches, numbered as before; Stage 1, archaic unspecialised arrangement (*Osmylidæ*); Stage 2, intermediate stage, with two series of gradate veins foreshadowed; Stage 3, the Gradate Series completed (*Chrysopidæ*), and the other crossveins suppressed; gs₁ proximal, and gs₂ distal Gradate Series. Diagrammatic. (Original).

In some genera (e.g., *Acanthaclisis*, *Glenoleon*), the branches of the radial sector are bent in a peculiar manner, so that, with the aid of a series of reduced crossveins between them, an apparently continuous, or nearly continuous, straight line is formed, running through the middle of the apical third of the wing. This line is

used as a generic character. As the description of the formation of this line usually occupies two or three lines of print, and is unwieldy for use in dichotomous tables, generic definitions, and so forth, it seems advisable to give it a definite name. I therefore propose here the name *Banksian Line* for it, in honour of Mr. Nathan Banks, who has done so much to advance the study of Neuroptera, and has described an immense number of new species from all parts of the world.

The *Banksian Line* should be contrasted phylogenetically with the development of crossveins known as the *Gradate Series* in *Chrysopidae* and other families of Neuroptera. Both formations are derived from the typical archaic arrangement of the branches of the radial sector seen in *Nymphidae*, and still preserved for us in *Myrmeleon* and other genera. In Text-fig.9, the series A shows the formation of the Banksian Line, the Series B the formation of two Gradate Series.

Those genera in which the Banksian Line is well-developed must be considered, at any rate in this respect, as the highest developments in their respective subfamilies. Thus, *Acanthaclisis* is evolutionarily at the head of the *Myrmeleoninae*, *Glenoleon* at the head of the *Dendroleoninae*.

(b) *The Hypostigmatic Space*. (Text-fig.6, hs).

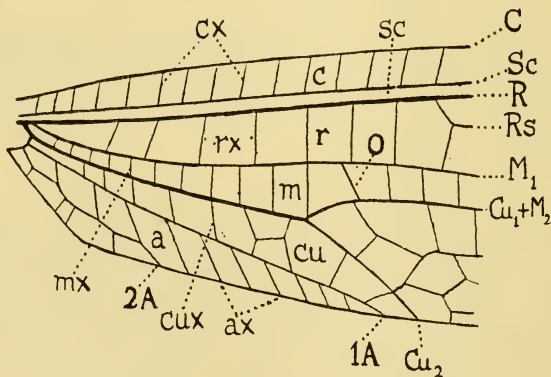
Below the pterostigma in *Myrmeleonidae*, there is a narrow elongate cell devoid of crossveins, and enclosed by R above and Rs below. This space I here designate as the *Hypostigmatic Space* (Text-fig.6, hs). Proximally, it is bounded by a more or less slanting crossvein which may be termed the *radial brace* (Text-fig.6, rb), distally by an isolated crossvein of unspecialised form. The hypostigmatic space is present in *Nymphidae*, and is very constant in all *Myrmeleonidae*. It may, however, be used as a convenient basis of reference for stating the position of spots and colouring on and around the pterostigma, the latter organ being merely an assemblage of crowded crossveins, with ill-defined limits. Besides this, for any given species, the number of branches of Rs may conveniently be stated up to the limit of rb, and the position of rb itself, whether standing directly over one

of these branches, or between two of them, may be of some value in specific diagnosis.

(c) *The Cubital Fork.*

The term "fork" is usually applied, in venation, to *the point of bifurcation* of a vein, and not to one of the resulting branches. It is unfortunate, therefore, that Cu_2 has been termed the "cubital fork" in *Myrmeleonidae*, especially as the term "lower branch of cubitus" takes priority, and is free from objection. I propose to restrict the term "fork" to its more legitimate meaning; so that, in future, by "cubital fork" the point of bifurcation of Cu will be indicated, while by "median fork" (in the forewing only), we shall understand the point at which the oblique vein O leaves M_1 . The abbreviations *cuf* and *mf* may be employed for these two points respectively.

(d) *The Basal Spaces.* (Text-fig.10).



Text-fig. 10. — Basal spaces and crossveins in forewing of a *Myrmeleonid*.

For nomenclature, see text. (Original).

The spaces into which the main veins divide the wing at the base, are named from the vein bounding them *anteriorly*, as follows.

(i.) *Costal space* (c) between C and Sc, from base to pterostigma. This has been called the "subcostal space" by some authors. The crossveins in it should be called "costal crossveins" (cx), not subcostals.

(ii.) *Subcostal space* (sc), the very narrow space between Sc and R, from base to pterostigma. It has no cross-veins in *Myrmeleonidæ*.

(iii.) *Radial space* (r), between R and M, from base to origin of Rs. The crossveins in it should be termed "radial crossveins" (rx); there is only one of these in the hindwing of the *Dendroleoninæ*.

(iv.) *Median space* (m), between M and Cu, from base to oblique vein. The crossveins in it are the "median crossveins" (mx).

(v.) *Cubital space* (cu), between Cu and 1A, from base to Cu. The crossveins in it are the "cubital crossveins" (cux). The shape of this area, and the number of rows of crossveins in it, are of considerable systematic importance.

(vi.) *Anal space* (a), between 1A and the posterior border of the wing. It may also be termed the "anal field," since it includes 2A, and the remnant of 3A if present. Its form and extent are of considerable systematic importance, as are also the number and length of the "anal crossveins" (ax) running from 1A to the posterior border.

NOTE ON THE GENDER OF GENERIC NAMES IN MYRMELEONIDÆ.

It might seem superfluous now-a-days to quote the rule given in Art. 14 of the International Rules for Zoological Nomenclature, that specific names, when adjectives, must "agree grammatically with the generic name." However, it is necessary to do so, since numerous authors seem to imagine that any generic name ending in "*on*" must necessarily be neuter. Thus we have recently had the whole of the specific names in *Glenoleon* written in the neuter by authors, though Rambur, in an age before Greek was despised or disregarded by scientists, described the type-species of this genus as *Myrmeleon pulchellus*. In a recent paper, I find, on the same page, two new species, *Protoplectron costatus* and *P. pallidum* described! Other examples are *Pseudoformicaleo nubecula*, *Callistoleon erythrocephalum*, etc. As the terminations in use for generic names in *Myrmeleonidæ* are very few, it may be as well to give their derivations and genders for the guidance of future workers:—

-*leon* (Greek λέων, a lion, *masculine*) e.g., *Myrmeleon*, *Callistoleon*, *Glenoleon*, *Dendroleon*, and many others. These must all take *masculine* specific names.

-*plectron* (Greek πλῆκτρον, a spur, *neuter*), e.g., *Protoplectron*.

-*clisis* (Greek κλίσις, a bending, *feminine*), e.g., *Acanthaclisis*.

-*ourus* (correctly -*ura*, from Greek οὐρά, a tail, *feminine*), e.g., *Glenurus*, *Macronemurus*. As these have a *masculine* form, they take *masculine* specific names.

-*leo* (Latin leo, a lion, *masculine*), e.g., *Formicaleo*, *Pseudoformicaleo*.

It should also be noted that the *correct* family-name for the Ant-lions is not *Myrmeleonidae* but *Myrmeleontidae*. By the International Rules, Art.4, "the name of a family is formed by adding the ending *idae* to the root of the name of its type-genus." The root of λέων is λεόντ-; hence *Myrmeleontidae*. Similarly we should have the subfamilies *Dendroleontinae* and *Myrmeleontinae*.

EXPLANATION OF PLATE LVIII.

Fig.1.—Tracheation of forewing-sheath of *Myrmeleon uniseriatus* Gerst., ($\times 19$). [Compare Text-fig.4].

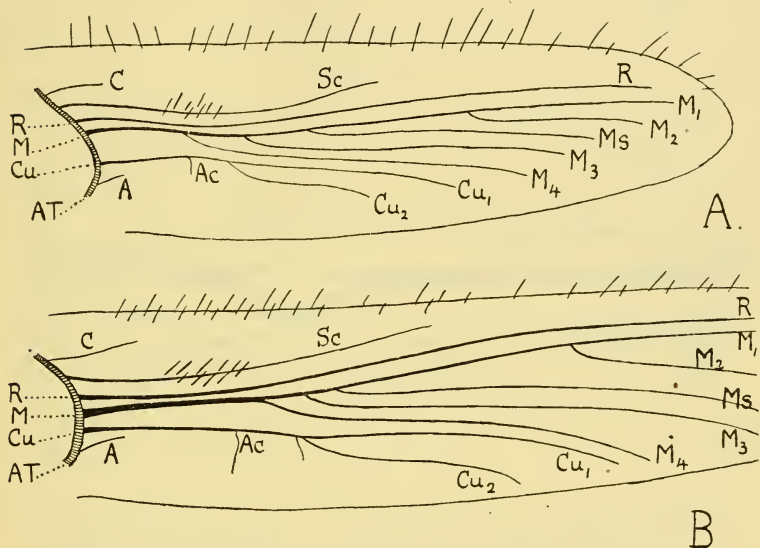
Fig.2.—Ditto, a portion much enlarged, ($\times 50$). [Compare Text-fig.5].

Fig.3.—Ditto, hind wing-sheath, ($\times 19$). [Compare Text-fig.7].

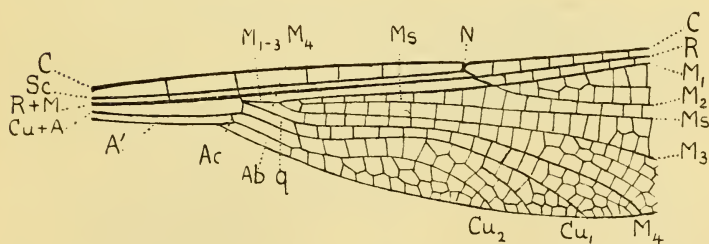
(POSTSCRIPT: added December 27th, 1915).—Since the above was written, Mr. Esben Petersen has drawn my attention to the fact that Navás has employed the term *linea plicata* for what, in this paper, is designated the *Banksian line*. Mr. Petersen is of opinion that the term *linea plicata* is objectionable, and is unwilling to accept it. I must here express my agreement with Mr. Petersen on this point on the ground that the term "plicata" in no way describes either the complex formation of this structure, nor its final result, which, in its most highly developed form, is a "linea recta." It is because I am strongly of opinion that no single word or phrase can be coined, which will indicate the peculiar structure of the *Banksian line*, that I have fallen back upon a practice that is very generally observed in these difficult cases in Biology, and named this line after one of our foremost contemporary workers on the Neuroptera.

APPENDIX.

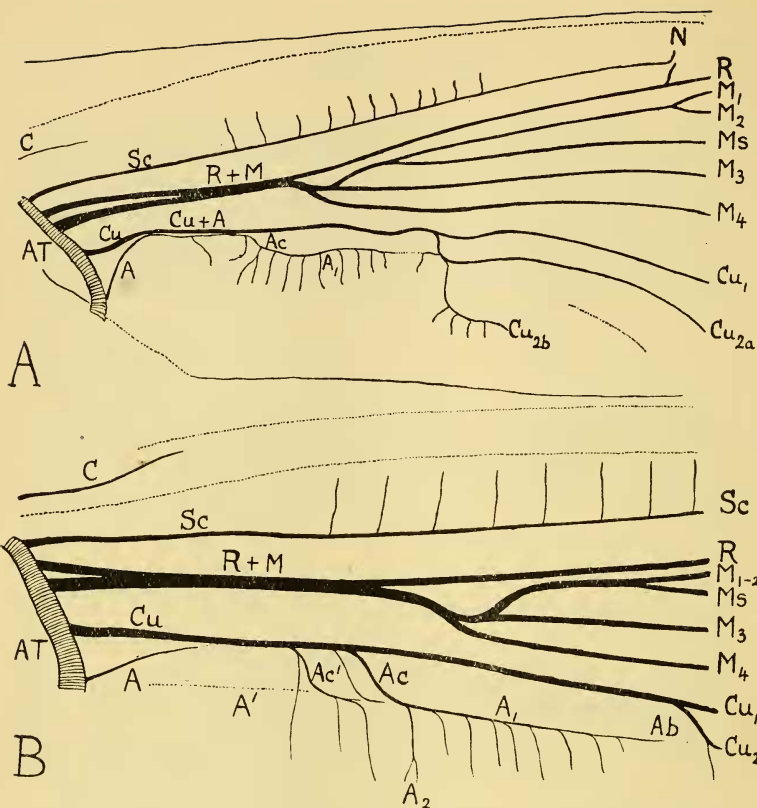
The text-blocks above the legends of Text-fig.1 and Text-fig.3 on pp.215 and 217 of Mr. Tillyard's paper "On the Development of the Wing-venation in Zygopterous Dragonflies, &c.," (*antea*, p.212), were inadvertently transposed. The figures are now re-printed as they should have appeared in the original paper. [ED.]



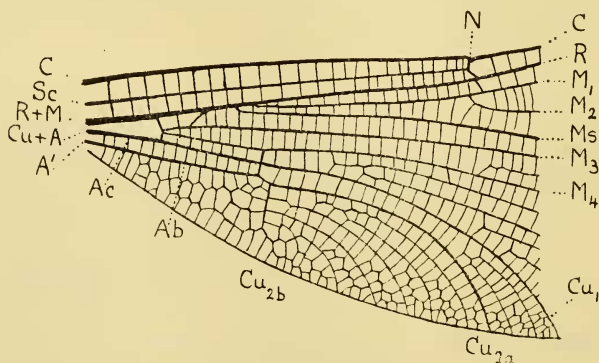
Text-fig.1.—Tracheation of larval wing of *Diphlebia lestoïdes* Selys. A. Antepenultimate instar. B. Penultimate instar. Compare Pl. xxxii., figs 1-3, Pl. xxxiii., fig.1.



Text-fig.2.—Imaginal venation of *Diphlebia lestoïdes* Selys, for comparison with Text-fig.1.



Text-fig. 3.—Tracheation of larval wing of *Calopteryx splendens* Harris.
A. Penultimate instar. B. Last instar. Compare Pl xxxiv., figs. 2-3.



Text-fig. 4.—Imaginal venation of *Calopteryx splendens* Harris, for comparison with Text-fig. 3.